## REMARKS

In the Office Action dated June 13, 2006, the Examiner maintained the previous election requirement and withdrew Claims 4, 5, 19-26, 30-31 and 46-53 as suggested by Applicant. The Examiner additionally withdrew Claims 7, 33 and 37. Claim 54 was rejected under 35 U.S.C. §102(b) as being anticipated by Kita. Claims 54-57 and 59 were rejected under §102(e) as being anticipated by Monette. Claims 58 and 60 were rejected under 35 U.S.C. §103(a) as being unpatentable over Monette in view of Kita. Claims 1,2, 6, 8-10, 12, 14, 15-18, 27, 28, 32, 34-36, 38, 39 and 41-45 were rejected under §103(a) as being unpatentable over Johnson in view of Kita. Claims 11, 13, 40 and 41 were rejected under §103(a) as being unpatentable over Johnson in view of Monette. Claims 3 and 9 were rejected under §103(a) as being unpatentable over Johnson in view of Kita and Smith.

Applicant and his representative met with the Examiner and her supervisor on August 29 to discuss the differences between the approaches of Kita and Monette, and the present invention. Applicant wishes to thank the Examiners for their time and thoughtful consideration.

With regard to the election requirement, Applicant would respectfully submit that Claims 7 and 33 should not have been withdrawn, as they are properly included within the group elected by Applicant. Applicant provisionally elected the first species identified in the election requirement, *viz.*, using nuclear resonance stimulation before the combustible material reaches the combustion chamber. Claim 7 recites stimulating "a first component of the combustion material in an intake to the combustion chamber with nuclear magnetic resonance" while Claim 33 recites "a nuclear magnetic resonance source which stimulates a first component of the combustion material in said intake." Claims 7 and 33 thus include the feature that corresponds to the elected species. The Examiner has withdrawn these claims since they include additional features, but the presence of other features is not grounds for excluding the claims from the elected species. Claims 7 and 33 are "linking claims" which are discussed in MPEP §809. It may be permissible to make an election requirement when linking claims are present, but the "linking claims must be examined with, and thus are considered part of, the invention elected." A contrary approach would result in the inability to ever present Claims 7 or 33, regardless of

Applicant's election. Applicant accordingly requests reconsideration of the withdrawal of Claims 7 and 33, and respectfully asks that they be reinstated.

With regard to the rejection of Claim 54, Applicant would respectfully submit that Kita does not anticipate the present invention because that reference fails to teach a feedback control unit "for a nuclear resonance stimulation source" having control logic which determines "an operational adjustment factor for the nuclear resonance stimulation source" as recited in Claim 54. Kita has nothing to do with nuclear resonant stimulation, and never discusses nuclear magnetic resonance (NMR) or nuclear quadrupole resonance (NQR). The Office Action has no explanation regarding the ostensible control logic of Kita other than referring to elements 10 and 16 of Kita. Element 16 of Kita is a magnet, and element 10 is the microprocessor which controls the magnet. Kita uses magnetic treatment of fuel to improve combustion, but the nature of Kita's process is totally different from that claimed by Applicant. The effects relied on by Kita are diamagnetism and paramagnetism, and are achieved using a single magnetic field. The magnetic field is static in the sense that its orientation never changes, only its intensity. The microprocessor 10 of Kita is used only to vary the power, not any frequency. In contrast, nuclear resonance requires a changing magnetic field, or radio-frequency signal, having a specific frequency. There is no indication in Kita of how that apparatus could be used to provide a dynamic electromagnetic field with the specific frequency needed for nuclear resonant stimulation. The difference is further evident from Kita's statement that nitrogen is non-reactive to that process (column 7, lines 7-8), while Applicant's specification teaches that nitrogen may be a specific target of the nuclear resonance (page 9, lines 17-19, and page 10, line 21 through page 11, lines 7). Since Kita has no control logic that determines an operational adjustment factor for nuclear resonant stimulation, it does not teach each and every element of Applicants' claims, and it accordingly cannot anticipate the present invention.

With regard to the rejection of Claims 54-57 and 59, Applicant would respectfully submit that Monette does not anticipate the present invention because that reference similarly fails to teach a feedback control unit "for a nuclear resonance stimulation source" having control logic which determines "an operational adjustment factor for the nuclear resonance stimulation source" as recited in Claim 54. As with Kita, Monette says nothing about nuclear resonance (NMR or NQR). Monette's physical mechanism is polarization of the combustion materials, which again is a completely different phenomenon from nuclear resonance. While Monette

extensively describes the electronics of the apparatus, there is no explanation of the physical mechanism that is relied on to improve fuel efficiency other than to note that "Nicolai Tesla discovered the relationship between the polarization of combustible matter and the quality of the combustion." The mechanism may, however, be better understood with reference to scientific publications such as the enclosed article by Suzuki et al., "Optimal Control of Multiphoton Ionization Processes in Aligned $I_2$ Molecules with Time-Dependent Polarization Pulses," Physical Review Letters, vol. 92, n. 13 (April 2, 2004), whose publication is contemporaneous with Monette. The Suzuki article explains how polarization affects the molecular axis and can align molecules, which may lead to enhanced ionization. Thus, polarization of the fuel as taught by Monette induces rotation of a molecule as a whole, and affects every polar molecule in the fuel mixture (any molecule that has a permanent electric dipole moment); conversely, it cannot affect molecules that are not polar. In contrast, nuclear resonance stimulates a nucleus at the sub-atomic level, and does not induce rotation of an entire molecule or affect every polar constituent of the combustion material; rather, it perturbs the orientation of the nucleus which alters the surrounding electromagnetic field (electron cloud), and it can affect molecules that are not polar. For example, methane ($CH_4$) is not a polar molecule and so it is not affected by the apparatus of Monette, but methane would be affected by nuclear resonance stimulation as claimed by Applicant when the frequency is targeted for hydrogen (H-1).

These differences between the polarizing fuel system of Monette and the present invention are also reflected in the range of frequencies involved. Monette mentions a frequency range of a few kilohertz to nearly 60 kilohertz (col. 3, lines 61-63), and lists several specific frequencies within this range (col. 4, lines 20-21). These frequencies are too low to provide nuclear resonance stimulation. In contrast, Applicant's invention emits electromagnetic pulses specifically adapted to provide nuclear resonance stimulation of targeted nuclei such as hydrogen (H-1) or nitrogen (N-14) (see page 9, lines 17-19 of Applicant's specification), and gives an exemplary frequency of 30 megahertz within a range of 1 to 50 megahertz (page 13, lines 25-27). Applicant's specification recognizes the criticality of the proper frequency in noting that even individual molecular compositions of targeted elements will have unique input resonant frequency requirements (page 15, lines 26-28). Moreover, Monette provides no indication of how the frequency of the stimulation source would be adjusted, and certainly never discusses how the frequency would specifically be adjusted for a nuclear resonant stimulation source. It is

thus clear that one skilled in the art would not understand Monette to refer to Applicant's inventive subject matter. With further regard to Claim 57, Monette says nothing about "a frequency adjustment value", and such a value is neither inherent in nor suggested by the specific circuits of Figure 3 in Monette. Selection of a particular circuit for use as an oscillator also does not equate to "programmably" setting the value, since the value is fixed and cannot be programmed once the circuit is system is constructed. Since Monette fails to teach control logic that determines an operational adjustment factor specifically for nuclear resonant stimulation, it likewise cannot anticipate the present invention.

With regard to the rejection of Claims 58 and 60, the above arguments apply since this rejection is based on Monette and Kita, and those claims indirectly depend from Claim 54. Neither of those references disclose or suggest the determination of a operational adjust factor for nuclear resonant stimulation, so the proposed combination of Monette and Kita still does not result in Applicant's invention. There is no explanation of how any of the magnetic field sources would be modified for NMR or NQR, and no reason is given why one skilled in the art would be motivated to combine the references in such a manner. The feedback control logic of Kita and Monette is specifically adapted only for controlling a polarizing magnetic field, which has nothing to do with optimizing a nuclear resonance stimulation. The purpose and outcome of Applicant's claimed control logic is different and unique. Since neither Monette nor Kita discloses or suggests an operational adjust factor for nuclear resonant stimulation, the proposed combination accordingly cannot render the present invention obvious.

With regard to the rejection of Claims 1,2, 6, 8-10, 12, 14, 15-18, 27, 28, 32, 34-36, 38, 39 and 41-45, the above arguments again apply insofar as that rejection is based in part on Kita. Kita has nothing to do with nuclear resonant stimulation and there is no indication from either Kita or Johnson how the magnetic field source or microprocessor of Kita would be modified to carry out NMR or NQR. Independent Claims 1 and 27 explicitly recite the adjustment of a nuclear resonant stimulation source based on sensed operating parameters. As previously noted, Kita only adjusts the power (magnetic field intensity) and not any frequency, so the proposed combination of Johnson and Kita still fails to result in any adjustment which would affect a nuclear resonant stimulation source. The Office Action acknowledges that Kita does not adjust a nuclear resonant stimulation, but Johnson likewise does not teach any adjustment. Johnson would at most perform sporadically due to ever-changing resonant frequencies caused by

temperature and pressure fluctuations in the combustion process. These arguments also apply to the rejection of Claims 11, 13, 40 and 41 since those claims indirectly depend from Claim 1 or Claim 27. Independent Claims 15 and 42 explicitly recite that the travel time from the nuclear resonant stimulation to the combustion chamber is less than a resonance relaxation time of the selected components. The criticality of this feature is self-evident—if the travel time is longer than the relaxation time then the stimulation will have no effect on the combustion activity, and the failure of Johnson to address this parameter is one reason why the disclosure of Johnson is inadequate to obviate the present invention. Applicant's specification states at page 5, lines 3-5, that relaxation times are a "critical consideration" in the placement of NMR/NQR components for combustion enhancement systems. The Office Action acknowledges that Johnson does not provide any details in this regard. Indeed, the relaxation times for different components can be substantial, and a typical relaxation time for NMR (about 1 second) is orders of magnitude off from a typical relaxation time for NQR (around 0.001 second). With further regard to Claims 18 and 45, the foregoing arguments regarding Claims 1 and 27 also apply since Claims 18 and 45 recite the adjustment of a nuclear resonant stimulation source based on sensed operating parameters.

With regard to the rejection of Claims 3 and 9, the foregoing arguments apply inasmuch as that rejection is based primarily on Johnson and Kita. Neither Johnson nor Kita provide an adjustment of a nuclear resonant stimulation source based on sensed operating parameters, and Smith lacks this feature as well. There is still no explanation from the combination of Johnson, Kita and Smith as to how control logic would be modified to carry out NMR or NQR, and there is no reason why one skilled in the art would be motivated to include Smith in any combination. The Office Action states that Smith discloses that both NMR and NQR work to chemically identify specimens, but the present invention is not directed to identifying chemical specimens.

More generally, none of the proposed combinations support an obviousness finding because the proposed combinations still do not enable Applicant's invention. "In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." *Beckman Instruments, Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551 (Fed. Cir. 1989). This rule was recently re-affirmed in the case of *In re Kumar*, 418 F.2d 1361 (Fed. Cir. 2005). Even if a *prima facie* case of obviousness were established, such a showing is rebutted when the prior art does not enable the claimed subject matter. *Id.* at 1368.

The burden of rebuttal may simply be met by "sufficient reason or authority or evidence, on the facts of the case, to show that the prior art method would not produce or would not be expected to produce the claimed subject matter." *Id.* Applicant has made such a showing here. There is no suggestion contained within the cited references themselves on how their apparatuses or methods would be modified to carry out the invention claimed by Applicant, as previously explained. Johnson fails to teach any feedback mechanism for adjusting the nuclear resonance stimulation based on sensed operating parameters, and Kita and Monette similarly fail to teach any adjustment of nuclear resonance stimulation. As noted above, the nature of the nuclear resonance phenomenon is totally different from polarization, and the differences between the approaches are critical as stated in Applicant's specification.

Notwithstanding the foregoing, Applicant has amended independent Claims 1, 27 and 54 to clarify that the nuclear resonance stimulation source has a frequency which is specifically targeted for a selected combustion component, and this frequency is adjusted based on the sensed operating parameters. These amendments serve to further distinguish Applicants' invention from the cited references. Claims 11, 38 and 55 have been deleted, and the dependencies of Claims 12-14, 39-41, 56 and 58-60 have been amended for consistency. For all of the foregoing reasons, Applicant respectfully requests reconsideration of the §102(b), §102(e) and §103(a) rejections.

Applicant has made a diligent effort to advance the prosecution of this application by amending claims and pointing out with specificity how the claims as presented patentably define the invention over the prior art of record. In view of the remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the examiner is requested to telephone the undersigned.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, Mail Stop Amendment, P.O. Box 1450, Alexandria, VA 22313-1450, on September 1, 2006.

Jack V. Musgrove — Sept. 1, 2006

Attorney for Applicant(s) — Date of Signature

Respectfully submitted,

Jack V. Musgrove
Attorney for Applicant
Reg. No. 31,986
Telephone: 512-689-6116